

REMARKS

Claims 1-4, 6-28, and 30-50 are pending. Claims 1, 2, 8, 20, 24, 25, 28, 30 and 40 have been amended. Claims 47-50 have been added. Claim 29 has been cancelled. Applicants reserve the right to pursue the original claims in this application and in other applications.

Claim 40 is objected to for informalities. In particular, "said second polysilicon layer" lacks proper antecedent basis. Claim 40 has been amended to overcome the objection.

Claims 1 and 7 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,809,309 ("Kwon"). Applicants respectfully traverse the rejection.

Claim 1 recites a pixel sensor cell comprising, in part, "a photoconversion device comprising a region of a first conductivity type at a surface of the substrate and a region of a second conductivity type below the first conductivity type region, said photoconversion device having a pinning voltage" and "a gate located over said photoconversion device for changing said pinning voltage." Applicants respectfully submit that this limitation is not disclosed or taught by Kwon.

Kwon is directed to a CMOS image sensor. (Kwon, Abstract). Although the Kwon sensor may have a substrate and a photoconversion device, it does not disclose, teach or suggest "a photoconversion device comprising a region of a first conductivity type at a surface of the substrate and a region of a second conductivity type below the first conductivity type region, said photoconversion device having a pinning voltage" and "a gate located over said photoconversion device for changing said pinning voltage." Instead, Kwon shows a gate for controlling charge storage "near" the photodiode. (Kwon, col. 4, line 66 to col. 5, line 8; FIG. 5). Further, Kwon is directed to

an image sensor that increases charge storage, but does not facilitate charge transfer through a transfer gate. In contrast, the pixel sensor cell of claim 1 comprises a transistor that facilitates transfer of charge from photoconversion device to charge collection region. For these reasons, Applicants respectfully submit that the 35 U.S.C. §102(e) rejection of independent claim 1 and dependent claim 7 be withdrawn and the claims allowed.

Claims 20, 22-24, 26, 27, 44 and 46 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon. Applicants respectfully traverse the rejection.

Claim 20 recites an imager comprising, in part, "wherein each said pixel sensor cell is arranged such that a photodiode therein has a reduced pinning voltage (V_{PIN}) when a negative bias is applied to an associated photodiode gate." The limitation is not disclosed, taught or suggested by Kwon. Claim 24 recites a processing system comprising, in part, "a photoconversion device located within a substrate and comprising a region of a first conductivity type at a surface of the substrate and a region of a second conductivity type below the first conductivity type region and said photoconversion device having a pinning voltage, a gate located over said substrate first surface level and over said photoconversion device for changing said pinning voltage." As discussed above, this limitation is not disclosed, taught or suggested by Kwon. Accordingly, Applicants respectfully request withdrawal of this rejection.

Claims 4, 8-14, 16-19, 21 and 25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon in view of U.S. Patent No. 5,128,735 ("Ohmi et al."). Applicants respectfully traverse the rejection.

Claim 4 depends from claim 1 and includes and thus, includes the limitations of claim 1. As such, claim 4 recites, in part, "a photoconversion device comprising a

region of a first conductivity type at a surface of the substrate and a region of a second conductivity type below the first conductivity type region, said photoconversion device having a pinning voltage" and "a gate located over said photoconversion device for changing said pinning voltage." Claim 8 recites a pixel sensor cell and recites, in part, "a photoconversion device having a first doped region of a first conductivity type and a second doped region of a second conductivity type located within said substrate, said photoconversion device having a pinning voltage."

As mentioned earlier, Kwon fails to teach this limitation. Ohmi et al., by contrast, is directed to a photoelectric converter having a photosensor element. (Ohmi et al., Abstract). Like Kwon, Ohmi et al. do not disclose, teach or suggest "a photoconversion device comprising a region of a first conductivity type at a surface of the substrate and a region of a second conductivity type below the first conductivity type region, said photoconversion device having a pinning voltage" and "a gate located over said photoconversion device for changing said pinning voltage." Because cited references, individually and in combination, fail to teach or suggest all of the elements of claim 4, the claim is allowable. Applicants would further note that there is no teaching or suggestion in Kwon or Ohmi et al. for combining their teachings together. Accordingly, the rejection should be withdrawn and the claim allowed.

Claim 6 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon in view of U.S. Patent No. 6,040,593 ("Park"). Applicants respectfully traverse the rejection.

Claim 6 depends from claim 1 and thus, includes the limitations of claim 1. As such, claim 6 recites, in part, "a photoconversion device comprising a region of a first conductivity type at a surface of the substrate and a region of a second conductivity type below the first conductivity type region, said photoconversion device

having a pinning voltage” and “a gate located over said photoconversion device for changing said pinning voltage.” As mentioned earlier, Kwon fails to teach this limitation. Park, by contrast, is directed to a CMOS image sensor having a photo-sensing region and is cited for teaching a pinned photodiode. (Park, Abstract). Park does not disclose, teach or suggest “a photoconversion device comprising a region of a first conductivity type at a surface of the substrate and a region of a second conductivity type below the first conductivity type region, said photoconversion device having a pinning voltage” and “a gate located over said photoconversion device for changing said pinning voltage,” as recited by claim 1. Because cited references, individually and in combination, fail to teach or suggest all of the elements of claim 6, the claim is allowable. In addition, there is no motivation in the references to combine their teachings together. Accordingly, the rejection should be withdrawn and the claim allowed.

Claims 28, 31-36 and 38-42 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon in view of Park and Ohmi et al. Applicants respectfully traverse the rejection.

Claim 28 recites a method of forming a sensor and recites, in part, “forming a gate for changing said pinning voltage comprising a dielectric layer over said first surface level of said substrate, thereby forming a second surface level, and a polysilicon layer over said second surface level.” As discussed above, none of Kwon, Ohmi et al. and Park, even when considered in combination, disclose, teach or suggest “a photodiode gate for charging said pinning voltage.” There is also no motivation in the references for combining their teachings. Accordingly, the rejection of independent claim 28 and dependent claims 31-36 and 38-42 should be withdrawn and the claims allowed.

Claims 2, 3, 15, 29, 30, 37, 43, and 45 stand objected to as being dependent upon a rejected base claim. The Office Action indicates that the claims would be allowable if rewritten in independent form. Claims 2 and 30 have been rewritten in independent form to incorporate the allowable subject matter while deleting any unnecessary limitation. Claim 29 has been cancelled and rewritten in new form. In view of the above amendments, Applicants respectfully believe that the objection has been overcome.

In view of the above amendment, Applicants believe the pending application is in condition for allowance.

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Respectfully submitted,

By 

Thomas J. D'Amico

Registration No.: 28,371

DICKSTEIN SHAPIRO MORIN &
OSHINSKY LLP

2101 L Street NW

Washington, DC 20037-1526

(202) 785-9700

Attorney for Applicants